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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,974	06/27/2005	Yuichi Fujioka	2005_1029A	9262
513 7590 05/20/2010 WENDEROTH, LIND & PONACK, L.L.P. 1030 15th Street, N.W., Suite 400 East Washington, DC 20005-1503				
EXAMINER MCCRACKEN, DANIEL				
ART UNIT 1793		PAPER NUMBER		
NOTIFICATION DATE 05/20/2010		DELIVERY MODE ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/540,974

Applicant(s)

FUJIOKA ET AL.

Examiner

DANIEL C. MCCracken

Art Unit

1793

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 February 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 8-13, 15-28, 32-37 and 39-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 8-13, 15-28, 32-37 and 39-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Drafts/Person's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Status of Application

Applicants' response dated 2/17/2010 has been received and will be entered. No claim amendments were made, and as such the status of the claims is as filed on 5/6/2009, *i.e.* Claims 1-4, 8-13, 15-28, 32-37 and 39-47 are pending. Claims 5-7, 14, 29-31, and 38 are acknowledged as cancelled. The amendment to the specification (page 11, lines 4-13) has been received and is addressed *infra*.

Response to Arguments

Specification

Applicants have presented an amendment to page 11, lines 4-13 of the substitute specification. This amendment changes "a fine particle with high strength which is not porous" to "a high strength fine particle having low porosity." *See* (Amendment to Specification dated 2/17/2010). Applicants have perfected their foreign priority by submitting a translation of the priority documents, and have urged that this amendment is supported by page 19, paragraph [0057] of the certified translation. This paragraph states *inter alia* "In the present invention, the

closely packed fine particle means a high strength fine particle having low porosity.” (Translation 19: [0057]). The support is present in the translation. The amendment will be entered.

Claim Rejections – 35 U.S.C. §112

I. With respect to the rejection of Claims 1-4, 8-13, 15-28, 32-37, and 39-47 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, Applicants traversal is on the grounds that (succinctly stated) the language is now clarified in light of the foreign translation and amendment to the disclosure. *See generally* (Remarks of 2/17/2010 at 4). The Examiner is inclined to agree. As to Claims 15 and 44, the discussion in the remarks is persuasive. The rejection is WITHDRAWN.

Claim Rejections – 35 U.S.C. §103

The Examiner agrees with Applicants characterization of the rejections set forth at (Remarks of 2/17/2010 at 7) insofar as the relationship of the rejections relates to the construction given to the term “void ratio.” In light of the amendments to the disclosure discussed above, rejections I-VI (which interpreted “void ratio” as relating to the bed of particles) are WITHDRAWN.

VII. With respect to the rejection of Claims 1-3, 8-11, 13, 19-26, 32-37, 39-41, and 43 under 35 U.S.C. 102(b) as being anticipated by US 6,413,487 to Resasco, et al. in view of Kim, et al., *Synthesis and Pore Size Control of Cubic Mesoporous Silica SBA-1*, Chem. Mater. 1999;

11: 487-491,¹ Applicants traversal is on the grounds that “[Resasco] fails to disclose, or even recognize, the problem which is improved by the presently claimed invention.” (Remarks of 2/17/2010). This consideration is not relevant to the obviousness inquiry. The Supreme Court has stated:

In determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the patentee controls. What matters is the objective reach of the claim. If the claim extends to what is obvious, it is invalid under §103. One of the ways in which a patent's subject matter can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims.

The first error of the Court of Appeals in this case was to foreclose this reasoning by holding that courts and patent examiners should look only to the problem the patentee was trying to solve. 119 Fed. Appx., at 288. The Court of Appeals failed to recognize that the problem motivating the patentee may be only one of many addressed by the patent's subject matter. The question is not whether the combination was obvious to the patentee but whether the combination was obvious to a person with ordinary skill in the art. Under the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

KSR Int'l. v. Teleflex, Inc., 550 U.S. 398, 419-420 (2007) (emphasis added). The problem Applicants were trying to solve is not the sole rationale that can support an obviousness rejection. Applicants go on to state:

Furthermore, the Examiner states that Resasco explicitly teaches that variables affect the nanotube/nanofiber yield. The passage relied upon by the Examiner (col. 3, lines 59-64) discloses that the

¹ It would appear as if the incorrect “form paragraph,” namely one for anticipation rejections, was inadvertently and accidentally used. The rejection was clearly based on obviousness grounds and was set forth in the section of the office action for rejections under 35 U.S.C. §103. Applicants appear to understand and properly interpret the rejection as one under 35 U.S.C. §103.

yield of nanotubes is affected by the catalyst formulation (e.g., transition metal ratio, type of support, and metal loading). However, Applicants respectfully assert that these teachings do not teach or suggest *void ratio* as a variable for affecting the nanotube yield.

(Remarks of 2/17/2010 at 8). The Examiner respectfully submits that this is a distinction without a difference. As noted in the sentence immediately prior to that which Applicants quote from the Non-Final Office Action of 8/18/2009, Resasco teaches employing zeolites or porous material as a catalyst support. *See* (Resasco 7: 58-62) (“The catalyst is preferably deposited on a support such as silica (SiO₂), MCM-41 (Mobil Crystalline Material-41), alumina (Al₂O₃), MgO, Mg(Al)O (aluminum-stabilized magnesium oxide), ZrO₂, molecular sieve zeolites, or other oxidic supports known in the art.”). Resasco then goes on to state that these supports affect the yield of nanotubes. (Resasco 3: 59-64). The Kim reference discusses silica, *i.e.* the very support mentioned by Resasco. *See e.g.* (Kim at 488, col. 2) (“We performed the synthesis of mesoporous silica . . .”). Note also the discussions of MCM-41 at (Kim at 489, col. 1), *i.e.* another support identified by Resasco.

The Examiner would agree that Resasco does not state *in haec verba* “void ratio.” That said, Resasco explicitly states that certain supports are *preferable* (Resasco 7: 58-62) (*i.e.* directing the skilled artisan to references addressing those supports) and explicitly teaches that these supports affect nanotube yield. (Resasco 3: 59-64). Kim provides teachings of how to modify pore size and in turn surface area/void ratio. *See e.g.* (Kim at 491, “Table 2”). Stated differently, surface area and void ratio are two ways of saying the same thing. A low void ratio (*i.e.* few voids or pores) would give rise to a lower surface area, and vice versa. Applicants observation related to pore size and adsorption of gas - *see* (Remarks of 2/17/2010 at 8) – was

also recognized in Office Action - *see* (Non-Final Office Action dated 8/18/2009 at 12). In light of this agreed finding, the Examiner respectfully disagrees with the assertion that “the technical field of Kim is quite different from that of the presently claimed invention (and of Resasco).” (Remarks of 2/17/2010). Kim in fact states “Mesoporous molecular sieves have attracted much attention *as a catalyst support*, adsorbent, and host for nanometer-scale quantum objects.” (Kim at 487, col. 1) (emphasis added, citations omitted). *See also* (Kim at 491, col. 2) (“The SBA-1 materials may be considered for various applications in adsorption, separation, *and catalysis*.”) (emphasis added). Resasco is a catalytic process. *See e.g.* (Resasco 2: 54 *et seq.*) (“Further, the invention contemplates a method wherein the catalytic particles are exposed to different process conditions.”). Adsorption of gas on a support is the very nature of gas phase catalysis. The “technical fields,” namely catalytic processes and catalyst supports are at minimum “related” or “similar,” and certainly overlapping subject matter, especially when Resasco states that these supports can be used and that they even effect nanotube yield.

No additional remarks or traversals were presented, nor do rejections VIII-XII appear to have been addressed. As such, no response is believed to be necessary. The rejection is MAINTAINED in light of the discussion above.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

I. Claims 1-3, 8-11, 13, 19-26, 32-37, 39-41, and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6,413,487 to Resasco, et al. in view of Kim, et al., *Synthesis and Pore Size Control of Cubic Mesoporous Silica SBA-1*, Chem. Mater. 1999; 11: 487-491 (hereinafter “Kim at ___”).

With respect to Claims 1 and 36, Resasco recites a method of producing carbon nanotubes. *See e.g.* (Resasco 3: 28 *et seq.*). “Fine particles” (i.e. catalysts) are employed, and the nanotubes grow on the catalyst. *See e.g.* (Resasco 4: 15-26). Nanotube/catalyst recovery is taught. *See e.g.* (Resasco 4: 40 *et seq.*). Note at least with respect to Claim 36, the particles are taught. (Resasco 7: 58-62). As to the “void ratio,” note that Resasco – like Applicants – teaches employing zeolites as the catalyst support. (Resasco 58-62). Note also the teachings of Resasco which state:

[T]he yield of nanotubes is affected by the *catalyst formulation (e.g., transition metal ratio, type of support, and metal loading)*, by the operating parameters (e.g., reaction temperature, catalytic gas pressure, space velocity and reaction time), and by pretreatment conditions (e.g., reduction and calcination).

(Resasco 3: 59-64) (emphasis added). Optimizing the porosity of the catalyst when it is a known result-effective variable does not impart patentability. MPEP 2144.05. Control of pore size (and in turn volume, void fraction, etc.) is well within the skill in the art. *See e.g.* (Kim at 491, “Table 2”) (illustrating the control over pore size by varying synthesis conditions). Pore volume/size would affect gas diffusion. Notwithstanding the ambiguities noted in other places in this office

action, control of the “void ratio” of individual catalyst particles would appear to be “[a]pplying a known technique to a known device (method, or product) ready for improvement to yield predictable results.” MPEP 2143. Here, control of pore volume (Kim) is known. Resasco suggests that this affects yield. (Resasco 3: 59-64). The results (i.e. making nanotubes/nanofibers) appear predictable. Likewise, the results achieved (making nanotubes/nanofibers) appear to be entirely expected, *i.e.* there are no “unexpected” results.

As to Claims 2 and 37, a “fluidized bed” process – which is being interpreted as the “fluidizing layer” – is taught. (Resasco 12: 47- 13: 42). As to Claim 37 specifically, the post-reaction treatment is taught. (Resasco 4: 40 *et seq.*). As to Claim 3, the catalyst is fluidized and carbon nanotubes grow from the catalysts. (Resasco 12: 47- 13: 42). As to Claim 4 the post-reaction treatment is taught. (Resasco 4: 40 *et seq.*) As to Claim 8, silica, alumina and other zeolites are taught. (Resasco 7: 58-62). As to Claims 9 and 39, any number of separation and recycle steps are taught. *See e.g.* (Resasco “Fig 4,” and accompanying text). As to Claims 10 and 40, these claims read on a catalyst on a support, clearly taught by Resasco. (Resasco 7: 52 *et seq.*). As to Claims 11 and 41, any number of metals – including Group VIII (Co, Ni, Pt) are taught. (Resasco 7: 12 *et seq.*). As to Claims 13 and 43, “additive particles” are taught. (Resasco col. 7-8). The zeolites are different shapes than the metal particles. *Id.*

With respect to Claim 19, Resasco teaches reactors with heating means and catalyst recovery separation means. (Resasco “Figures 2-5,” 9: 1 *et seq.*). To the extent Resasco may not recite *in haec verba* a “heating apparatus,” it is expected to necessarily disclose one. Note that Resasco makes numerous mention of heating steps. *See e.g.* (Resasco 3: 65 *et seq.*, 7: 1 *et seq.*). This is the evidence offered to prove inherency. “[T]he PTO can require an applicant to prove

that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. In *re* Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re* Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). See above with respect to the void fraction, but also note that the apparatus is not limited by the material worked on. MPEP 2115. As to Claim 20, a fluidized bed reactor (i.e. the "fluidizing layer reaction apparatus") is taught. *See e.g.* (Resasco 12: 47 *et seq.*). As to Claim 21, a "catalyst supplying apparatus" is taught. *See e.g.* (Resasco 9: 55 *et seq.*). As to Claim 22, a gas is considered a liquid, and as such, a fluidized bed reactor supplies the catalyst in the presence of a gas, or something in the "liquefied state." *See* (Resasco 3: 65 *et seq.*) As to Claims 23-26, a "catalyst supplying apparatus" is taught. *See Id.* Note that "solid" catalysts are taught. (Resasco 7: 12 *et seq.*). See above with respect to the fluidized bed - as the bed is fluidized, it necessarily has a gas supplying apparatus. *See also* (Resasco "Figs. 2-5"). As to Claim 32, see discussion of Claim 8 *supra*. As to Claim 33, Resasco recites pressures above 0.01 MPa (Resasco 4: 10-15) and temperatures in the claimed range. (Resasco 7: 1-5). As to Claim 34, Resasco teaches a collision unit. *See e.g.* (Resasco "Fig. 2") *and* (Resasco 9: 1 *et seq.*) Catalysts collide with any of the parts shown or disclosed. Therefore, a "collision unit" is taught. As to Claim 35, heat transfer is described. *Id.*

II. Claim 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claim 19 above, and further in view of US 5,618,875 to Baker to show a state of fact.

The preceding discussion of Resasco and Kim is expressly incorporated herein by reference. As to Claim 28, to the extent Resasco *may* not recite *in haec verba* the catalyst (i.e. “fine particle”) diameter, it is expected that the diameter is necessarily disclosed. It is well known that the diameter of carbon nanotubes/nanofibers is controlled by the diameter of the catalyst particle. This teaching is reflected in numerous places, for example US 5,618,875 to Baker, et al. *See* (Baker 5: 9-10) (“The catalyst particle size determines the diameter of the filament”) Baker, like Resasco, teaches the production of carbon nanofibers. *See* (Baker 3: 10 *et seq.*). Baker also teaches catalyst sizes of 25 Å (= 2.5 nm, *i.e.* within the claimed range). (Baker 5: 8). Therefore, it is expected that the catalysts (i.e. fine particles) as taught in the apparatus of Resasco have the same size as claimed. This is the evidence offered to prove inherency. “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on *prima facie* obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

III. Claim 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claim 19 above, and further in view of US 5,618,875 to Baker.

The preceding discussion of Resasco and Kim accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. As to Claim 28, to the extent Resasco *may* not recite *in haec verba* the catalyst (i.e. "fine particle") diameter, catalyst diameter is a known result-effective variable. *See* (Baker 5: 9-10). Optimization of this does not impart patentability. MPEP 2144.05.

IV. Claims 15-18 and 44-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claims 1 above, and further in view of US 6,645,455 to Margrave, et al.

The preceding discussion of Resasco and Kim accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. With respect to Claims 15-18 and 44-47, notwithstanding the ambiguities noted above, note that Resasco employs washes in a variety of compounds: acidic, organic, etc. (Resasco 4: 42 *et seq.*). To the extent Resasco may not teach whatever is being claimed, Margrave teaches the compounds claimed. *See* (Margrave 7: 50 *et seq.*). One would be motivated to use such compounds, because they make nanotubes. *See Id.*

V. Claim 12 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claims 1 and 36 above, and further in view of US 6,761,870 to Smalley, et al.

The preceding discussion of Resasco and Kim accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. To the extent Resasco *may* not teach sulfur, this does not impart patentability. Sulfur is a well known catalyst promoter, and the Examiner takes official notice that it is. In support of taking official notices (i.e. in making sure there is substantial evidence on the record), the Examiner provides Smalley. *See e.g.* (Smalley 3: 28 *et*

seq.). One would be motivated to use sulfur for any number of reasons, for example promoting the catalytic reaction.

VI. Claim 27 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco and Kim as applied to claim 19 above, and further in view of US 5,102,647 to Yamada, et al.

The preceding discussion of Resasco and Kim accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. To the extent Resasco *may* not teach a rotary drum/kiln embodiment, these reactors are old, known, and an obvious expedient. *See e.g.* (Yamada 6: 5 et seq) (describing rotary kilns and fluidized beds).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCracken whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1793

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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